

In particular, the Examiner focuses on the fact that Olson discloses that the finite delay ratio (internal delay D_2 over the propagation delay D_1) between the two microphone elements of a first-order microphone system may be adjusted to effect all sound patterns between a bidirectional pattern and a non-directional pattern, thereby concluding that a first-order microphone system having a sound pattern with no nulls or otherwise a sound pattern having a finite delay ratio greater than one is known in the art. While Applicant does not necessarily disagree with this, Olson discloses that the finite delay ratio between microphone elements may be adjusted in the context of a first-order microphone system. There is no teaching or suggestion in Olson that such adjustments can be made to first-order microphone elements in the context of a higher order microphone system or what advantages or benefits could be attained by incorporating such microphone elements in a higher order microphone system. Indeed, the use of Olson to support a teaching that the finite delay ratio of first-order microphone elements can be arbitrarily adjusted until success or some benefit is achieved in a higher-order microphone system amounts to an improper “obvious to try” rationale forbidden by the MPEP. (See §2145.X.B).

While the Examiner does indicate that the finite delay ratio of first-order microphone elements can be adjusted to be greater than one to provide a flatter frequency response, Olson actually discloses that separate equalizing systems 3, not the adjustment of the finite delay ratio, are used to flatten the frequency response (see page 3, col. 2, lines 15-40), thereby teaching away from using the finite delay ratio to flatten the frequency response. Notably, the fact that first-order microphone elements have a flat frequency response by virtue of adjusting the finite delay ratio between the elements does not necessarily translate as a benefit in a higher-order microphone system in which the first-order microphone elements are incorporated. For example,

if the finite delay ratio of first-order microphone elements are adjusted to effect the sound pattern illustrated in Fig. 2a, thereby providing a flat frequency response illustrated in Fig. 3a, it follows that the first-order microphone elements will actually be transformed into zero-order microphone elements, thereby detrimentally reducing by one the order of a higher-order microphone system in which these microphone elements are incorporated.

In addition, independent claim 1 further requires that the microphone system be adapted to be positioned near a diffractive body, such as near a human body part (claim 2) or a human head (claim 3) or on a user's head (claim 11) or otherwise be part of a hearing aid (claim 12). While the Examiner indicates that it is well known to use directional microphone systems on a human head, as evidenced by Killion et al., the use of a higher-order microphone system adjacent a diffractive body, such as near a human head, has proven to be unsuccessful due to the near field diffractive effects that degrade the performance of the higher-order microphone system to that below a first-order microphone system. Prior to the invention, these near-field diffractive effects could not be adequately compensated for, especially where a single microphone design is intended for use by numerous individuals with varying head shapes and sizes. (see page 4, lines 4-15). Thus, it is not well known to use higher-order microphone systems near diffractive bodies. There is no teaching or suggestion in the prior art that the diffractive effects that result when a higher-order microphone system is placed adjacent a diffractive body can be compensated for in the manner required by claim 1.

Thus, Applicant submits that independent claims 1 and 14, as well as the claims depending therefrom (claims 2-13 and 15-27), are not obvious over Olson, either alone or in combination with the cited references, and as such, respectfully request withdrawal of the §103 rejections of these claims.

Claims 28-35

Claims 28-35 stand rejected under 35 U.S.C. §103 as being obvious over U.S. Patent No. 5,473,684 issued to Bartlett, et al. (“Bartlett”) in view of U.S. Patent No. 6,954,535 issued to Arndt, et al. (“Arndt”). Applicant respectfully traverses this rejection, since none of these references, alone or in combination, disclose, teach, or suggest the combination of elements required by these claims.

While Applicant agrees with the Examiner that Bartlett does not disclose testing a sound from the back direction of a microphone system, and that Arndt discloses testing a microphone system from behind with a loudspeaker, Applicant disagrees that the teachings of Arndt can be combined with those of Bartlett in the manner indicated by the Examiner. In particular, there is no teaching or suggestion in Arndt that a rear loudspeaker can be used to match two microphone elements. Arndt merely teaches that it is desirable to measure sound coming from the left, right, front, and rear in order to optimize filter parameters in a microphone system. There is nothing said or alluded to in Arndt that such measurements can be used to match microphone elements.

As stated in the application, prior methods for matching microphone elements in a directional microphone system used either an ambient sound with no directionality or a sound coming from the front, and it was the inventors that realized that matching the output of microphone elements in a second-order microphone systems from the rear is more important than matching the output from the front, since a relatively small mismatch in a rear output can result in a high total output error. (see page 6, lines 6-16). This teaching the Examiner cannot use. There is simply no teaching or suggestion in Arndt that the microphone elements disclosed in Bartlett can be matched from the rear.

Thus, Applicants believe that claims 28-35 are not obvious over the combination of Bartlett and Arndt, and as such, respectfully request withdrawal of the rejections of these claims.

Conclusion

Based on the foregoing, all claims are now allowable and a Notice of Allowance is respectfully requested. If the Examiner has any questions or comments regarding this amendment, the Examiner is respectfully requested to contact the undersigned at (714) 830-0606.

Respectfully submitted,

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